REMARKS

Entry of this amendment and reconsideration of this application is respectfully requested.

Support for the phrase "wherein said gate is disposed at around a tip of the core pin and at a perimeter of a bearing part" in claims 1 and 10 can be found at page 38, lines 2-4 in the specification. A bearing part have no weld line finds support in Embodiment 1 of the specification.

New Claims 21 and 22 are based on claims 1 and 10 respectively, and figures 6 and 7.

Claims 11 and 16 are canceled rendering objections and rejections of these claims moot.

Claims 1, 3-4 and 10 were rejected as allegedly obvious over Ikegama and Hayakawa and Shoji. Applicants respectfully traverse.

The Examiner argues that Shoji discloses gates disposed between a cavity and a core pin, the core pin being held in the cavity in the fixed template unconstrained. Shoji, however, does not disclose the gate being disposed at around a tip of the core pin and at a perimeter of a bearing part, and does not teach not to generate weld line in the bearing part as claimed in claims 1 and 10. Shoji only discloses pin gates (see "resin injection gates G are located in two recess portions 11a1 formed on the upper end face of shaft portion 11a," Col. 8, lines 36-40 and Fig. 6). The pin gates to be located in two portions inevitably generate two weld lines in the injection-molded product. The Examiner is also referred to the attached copy of "Weld lines" (http://islnotes.cps.msu.edu/trp/inj/geo_weld.html (Reference 1, 3 pages).

The lens holders of the present invention have an extremely excellent roundness of the bearing surface and cannot be manufactured by injection molding using a pin gates because the weld line to be generated in the bearing surface deteriorates roundness of the bearing surface. (See Embodiment 1 and Comparative Embodiment 1 in the specification.)

The gate of the present invention is disposed at around a tip of the core pin and at a perimeter of a bearing part. The resin is injected through the gate having ring form injection slit. (See Fig 6 and Fig 7 in the application). Thus bearing part of the present invention has no weld line.

The recited features of claim 1 and claim 10, including (a) a gate disposed at around a tip of the core pin and at a perimeter of a bearing part and (b) a bearing part have no weld line are not believed to be taught or suggested by Shoji.

Due to the features recited in claims 1 and 10, the core pin can be held in the cavity without inclinations and the bearing hole is formed vertically to the lens-receiving surface and the lens holder has excellent roundness for the bearing surface.

As claimed in claims 21 and 22, a tip of the core pin is held without contacting any parts in the cavity and is in the fixed template unconstrained. See Fig 6 and Fig 7 in the specification. It is not believed that the references teach or suggest that a tip of the core pin is to be held without contacting any parts in the cavity.

Thus, the core pin can be held in the cavity without inclinations and the bearing hold is formed vertically to the lens-receiving surface and the lens holder has excellent roundness for the bearing surface due to the recited feature of claim 21 and 22.

In view of the foregoing, allowance is respectfully requested.

If any additional fees are due, authorization is given to charge deposit account no. 50-0624.

Respectfully submitted,

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Enclosure

Reference 1

Weld lines

- Definition and causes of weld lines
- Strength issues with weld lines
- Minimizing the effect of weld lines

Causes of weld lines

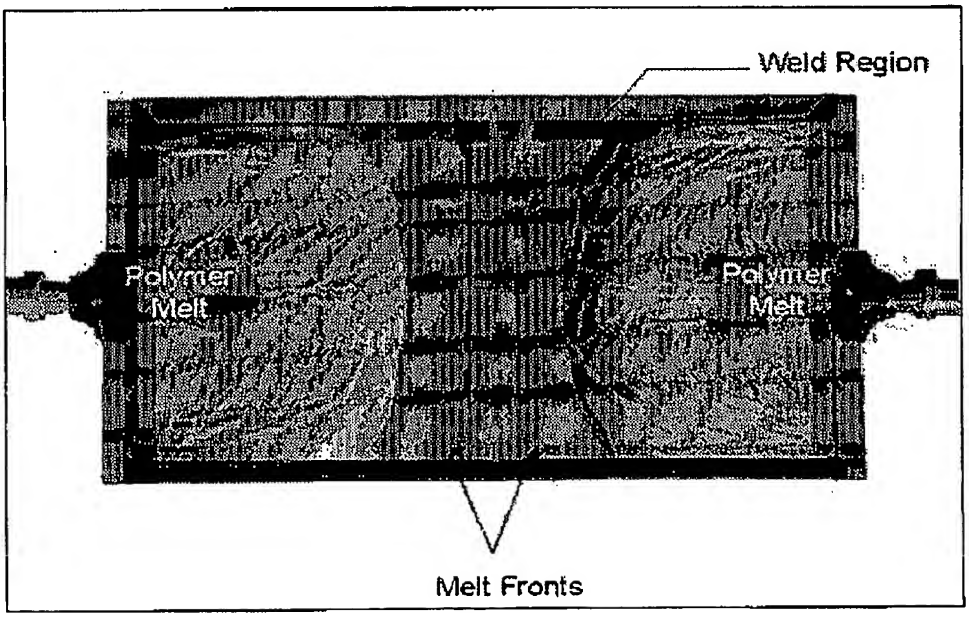
Weld lines refer to weaker regions formed by the impingement of two separate flow fronts. These may originate from multiple gates as shown here. The fibers near an advancing melt front are parallel to the front or perpendicular to the flow direction. This abrupt change in fiber orientation weakens this region.

Weld lines may be formed also by splitting and rejoining of flow fronts around inserts. The orientation of the weld line is affected by the position of the insert relative to the gate, as shown on the diagram here.

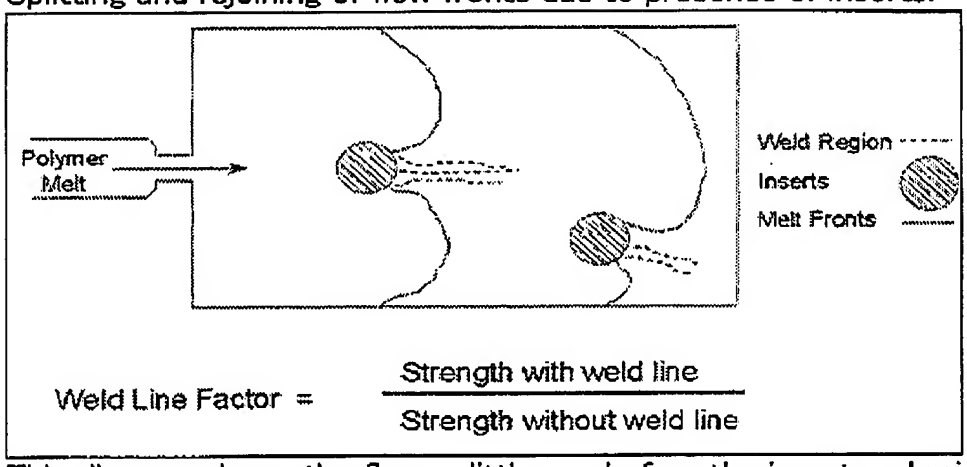
A weld line strength factor may be defined as the ratio of the composite strength in the presence of a weld line to the composite strength without weld lines .

Causes of weld lines in IM:

- Multigated molds leading to head-on impingement of two separate flow fronts.



- Splitting and rejoining of flow fronts due to presence of inserts.



This diagram shows the flow splitting up before the insert and rejoining after it.

At sufficiently high flow rates, instead of flowing uniformly, the polymer may shoot out of the gate until it impinges against the mold boundary and is compressed against the opposite wall. Backfilling fills in the rest of the mold. This phenomenon creates many weld lines.

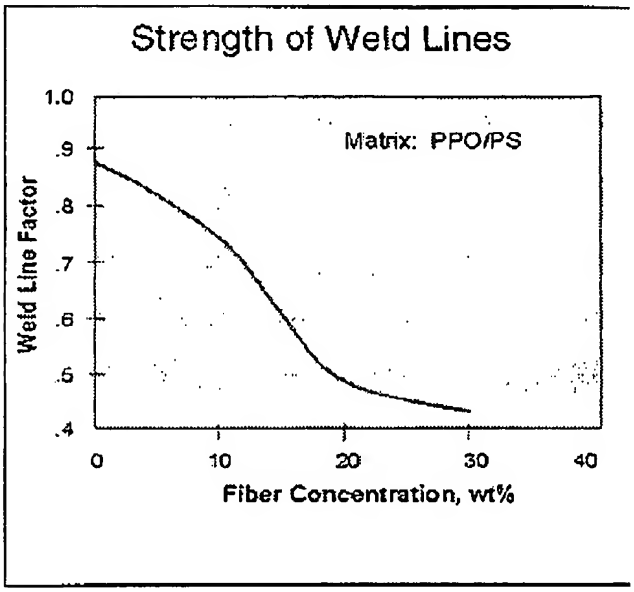
Strength issues with weld lines

Weld lines tend to weaken an injection molded part.

The weld line factor describes the weakening caused by the presence of a weld line.
Weld line factor = strength with weld line / strength without weld line.

This graph shows how weld line factor is affected by fiber concentration. Increasing the fiber concentration decreases the weld line factor.

The reason weld line factor drops with the addition of fibers is found in fiber orientation. Fibers at the flow front are oriented parallel to the front. The collision of two fronts to form a weld line results in fiber orientation parallel to the weld line. Thus, the strength across the weld line drops dramatically with respect to regions of the part without weld lines.



Minimizing the effect of weld lines

Guidelines to minimize the effect of weld lines:

1. Locate weld lines closer to a gate to make them strong. It is important to have enough pressure to get good packing.
2. Provide venting at the weld line.
3. Increase part thickness at the weld line
4. Increase melt temperature more flow.
5. Increase injection pressure and speed.

- Case Study: Fuel Rail (opens in new window)

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